

WHAT IS CLAIMED IS:

1. A head for a magnetic drive, comprising:

a substrate <sup>601</sup> with a thermal expansion rate CTE1;

a transducer <sup>604</sup> that has a bond to the substrate and that has a transducer thermal expansion rate CTE2 that is greater than CTE1, the transducer having two opposite sides; and

a first restraint layer <sup>640</sup> that has a bond to a first one of the sides of the transducer and that has a first restraint layer thermal expansion rate CTE3 that is less than CTE1.

2. The head of Claim 1 wherein the transducer and the first restraint layer are bonded together to have a combined expansion rate that is substantially matched with CTE1.

3. The head of Claim 1, wherein the first restraint layer has dimensions and material properties that are selected to limit protrusion of the transducer beyond the substrate over an operating temperature range.

4. The head of Claim 1, further comprising:

a second restraint layer <sup>652</sup> that has a bond to a second one of the sides of the transducer, and that has a second restraint layer thermal expansion rate CTE4 that is less than CTE1.

5. The head of Claim 4 wherein the transducer and the first and second restraint layers are bonded together to have a combined expansion rate that is substantially matched with CTE1.

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NiFe & Cu

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B. bonding a transducer with a thermal expansion rate CTE2 greater than CTE1 to the substrate, the transducer having two opposite sides; and

C. bonding a first restraint layer to a first one of the sides of the transducer, the first restraint layer having a thermal expansion rate CTE3 less than CTE1.

14. The method of Claim 13 further comprising:

D. bonding the transducer and the first restraint layer together to have a combined expansion rate that is substantially matched with CTE1.

15. The method of Claim 13 further comprising:

D. selecting dimensions and material properties for the first restraint layer to limit protrusion of the transducer beyond the substrate over an operating temperature range.

16. The method of Claim 13, further comprising:

D. bonding a second restraint layer to a second one of the sides of the transducer, the second restraint layer having a thermal expansion rate CTE4 that is less than CTE1.

17. The method of Claim 13 further comprising:

D. including a material in the first restraint layer selected from the group: aluminum nitride,  $\text{Si}_3\text{N}_4$  and  $\text{SiO}_2$ .

18. The method of Claim 13, further comprising:

D. forming the first restraint layer by thin film deposition.

19. A head for a magnetic drive, comprising:

a head assembly including a substrate and a magnetic transducer; and

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means for restraining thermal expansion of the magnetic transducer.

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